



**University of  
Zurich**<sup>UZH</sup>

**Zurich Open Repository and  
Archive**

University of Zurich  
University Library  
Strickhofstrasse 39  
CH-8057 Zurich  
[www.zora.uzh.ch](http://www.zora.uzh.ch)

---

Year: 2017

---

## **Clinical, sonographic and pathological findings in a Saanen goat with mediastinal thymoma**

Braun, Ueli ; Warislohner, Sonja ; Gerspach, Christian ; Ohlerth, Stefanie ; Wanninger, Sabrina ; Borel,  
Nicole

DOI: <https://doi.org/10.17236/sat00111>

Posted at the Zurich Open Repository and Archive, University of Zurich

ZORA URL: <https://doi.org/10.5167/uzh-138242>

Journal Article

Published Version

Originally published at:

Braun, Ueli; Warislohner, Sonja; Gerspach, Christian; Ohlerth, Stefanie; Wanninger, Sabrina; Borel, Nicole (2017). Clinical, sonographic and pathological findings in a Saanen goat with mediastinal thymoma. Schweizer Archiv für Tierheilkunde, 159(3):185-188.

DOI: <https://doi.org/10.17236/sat00111>

# Clinical, sonographic and pathological findings in a Saanen goat with mediastinal thymoma

U. Braun<sup>1</sup>, S. Warislohner<sup>1</sup>, C. Gerspach<sup>1</sup>, S. Ohlerth<sup>2</sup>, S. Wanninger<sup>3</sup>, N. Borel<sup>3</sup>

<sup>1</sup>Department of Farm Animals, <sup>2</sup>Clinic of Diagnostic Imaging and <sup>3</sup>Institute of Veterinary Pathology, Vetsuisse Faculty, University of Zurich

## Introduction

Thymomas are tumours that originate within the epithelial cells of the thymus, are infiltrated to varying degree by benign lymphocytes (Jacobs et al., 2002; Valli et al., 2015) and have been described in cats, dogs, horses, pigs, cattle, sheep and goats (Valli et al., 2015). In goats, thymoma often is an incidental finding at post-mortem (Jacobs et al., 2002) and the pathological findings have been described (Hadlow, 1978; Rostkowski et al., 1985; Parish et al., 1996; Olchoway et al., 1996; Braun et al., 2009; Löhr, 2013). The tumours may occur at different locations in the thorax, but are most commonly seen in the anterior mediastinum and thoracic inlet (Jacobs et al., 2002; Valli et al., 2015). Clinical signs greatly depend on the location and size of the tumour, but dyspnoea and oedema of the ventral head and neck regions are most common (Jacobs et al., 2002). A 8-year-old Saanen goat with recurrent tympany and regurgitation had a thymoma that displaced the oesophagus dorsally causing megaesophagus (Parish et al., 1996). Radiography of goats with thymoma revealed a mineralised mass in the thorax extending from the thoracic inlet to the forth intercostal space in one goat (Olchoway et al., 1996) and dilatation of the cervical oesophagus in another (Parish et al., 1996). Computed tomography has been used for assessment of one goat with thymoma (Braun et al., 2009). Two reports describe the ultrasonographic appearance of thymoma as an echoic mass with acoustic shadowing suggestive of mineralisation in a goat (Olchoway et al., 1996) and a mass with a grooved surface ventral to the lung with massive pleural effusion in another (Braun et al., 2009). This report describes an 11-year-old female Saanen goat with thymoma.

## Case history and Results

The goat originated from a farm with one other goat and had been treated for acute ruminal tympany twice

within a two-day period by the referring veterinarian. The goat was referred to the Department of Farm Animals, University of Zurich, because of a marked decrease in appetite and to determine the cause of ruminal tympany. On admission the goat was thin (48 kg), had bruxism and a starry hair coat and a mild decrease in appetite (Fig. 1). The rectal temperature was decreased at 37.2 °C (normal 38.6–40.0 °C) and the heart rate was within the reference interval at 88 bpm. Heart sounds were of normal intensity on the right side, but were muffled on the left side, and there was bilateral marked jugular vein distension. Respiration was costoabdominal with a rate of 24 breaths per minute, and auscultation of the lungs revealed increased breath sounds dorsally. There were strong ruminal contractions and no ruminal tympany. Examination of the remaining organs and organ systems showed no abnormal findings.

A complete blood cell count showed microcytic hypochromic anaemia with a haematocrit of 17 % (normal

<https://doi.org/10.17236/sat00111>

Received: 05.07.2016  
Accepted: 22.09.2016



**Figure 1:** Eleven-year-old Saanen goat with mediastinal thymoma. The goat has a poor body condition, a starry hair coat and distended jugular veins.

Clinical, sonographic and pathological findings in a Saanen goat with mediastinal thymoma

U. Braun et al.

24–35%, Tschuor et al., 2008) and severe leukocytosis (total leukocyte count of 41'000/ $\mu$ l; normal 7'800–19'600/ $\mu$ l), lymphocytosis (29'000 lymphocytes/ $\mu$ l; normal 3'530–11'880/ $\mu$ l) and neutrophilia (11'100 segmented neutrophils/ $\mu$ l; normal 2'550–9'910/ $\mu$ l). Serum biochemistry showed increased activity of  $\gamma$ -glutamyl-transferase ( $\gamma$ -GT, 68 U/l; normal 26–63 U/l), glutamate dehydrogenase (GLDH, 34.5 U/l; normal 3.1–19.8 U/l) and sorbitol dehydrogenase (SDH, 250 U/l; normal 20.4–68.7 U/l), an increased concentration of urea (12.6 mmol/l; normal 2.8–7.2 mmol/l) and a decreased concentration of calcium (1.57 mmol/l; normal 2.2–2.7 mmol/l). Fecal analysis showed trichostrongyle ova and protostrongyle larvae.

A laterolateral radiographic view with the goat standing and a dorsoventral view showed a soft tissue density mass within the ventral aspect of the thoracic cavity and border effacement of the cardiac silhouette and diaphragmatic margins (Fig. 2). The thoracic trachea was displaced dorsally, and the tracheal bifurcation was seen at the level of the 6th rib. The thoracic oesophagus was gas-filled and moderately dilated from the 2nd rib to the hiatus. At the level of the trachea, the oesophagus also was moderately displaced dorsally. Radiographic findings included pleural effusion, megaesophagus and a mass that was thought to be in the cranial mediastinum rather than in the lungs. Ultrasonography of the thorax and abdomen showed bilateral pleural effusion (Fig. 3), which caused dorsal displacement of the lungs and atelectasis of the ventral aspects. The lungs were difficult

to see in the left cranioventral aspect of the thoracic cavity because of a heterogeneous, irregular echogenic mass located between the heart and left thoracic wall (Fig. 4). Ultrasound-guided thoracocentesis using a spinal needle (0.90  $\times$  90 mm) yielded turbid fluid with a specific gravity of 1'018, a protein concentration of 20 g/l and a low total nucleated cell count consisting of 90% small lymphocytes and 10% monocytes, macrophages and neutrophils without toxic changes. There were no neoplastic cells, and the findings were consistent with lymphocytic inflammation.

Based on all the findings, a thoracic tumour, possibly lymphoma, was tentatively diagnosed in addition to haemonchosis and protostrongylosis. The owner requested the goat be discharged and it died at home the same



**Figure 2:** Standing laterolateral thoracic radiograph of a Saanen goat with mediastinal thymoma. There is a soft tissue density mass of moderate size in the ventral aspect of the thoracic cavity and border effacement of the cardiac silhouette and diaphragmatic margins. The thoracic trachea and oesophagus are displaced dorsally, and the tracheal bifurcation is seen at the level of the 6th rib. The thoracic oesophagus is gas-filled and moderately dilated from the 2nd rib to the hiatus. Radiographic findings include pleural effusion, megaesophagus and a mass in the cranial mediastinum.



**Figure 3:** Ultrasonogram of the thorax viewed from the left thoracic wall using a 5.0 MHz convex scanner in an 11-year-old Saanen goat with thymoma. The lungs are atelectatic and displaced dorsally by pleural effusion. The tumour is seen in the ventral part of the thoracic cavity as a heterogeneous echogenic mass. 1 Lateral thoracic wall, 2 Irregular outline of the pleura of the atelectatic lungs, 3 Pleural effusion, 4 Tumour, Ds Dorsal, Vt Ventral.



**Figure 4:** Ultrasonogram of the thorax viewed from the left thoracic wall using a 5.0 MHz convex scanner in an 11-year-old Saanen goat with thymoma. A heterogeneous echogenic tumour is seen between the left thoracic wall and the heart. 1 Left thoracic wall, 2 Tumour, 3 Left ventricle, 4 Right ventricle, Ds Dorsal, Vt Ventral.



day. Postmortem examination showed approximately 1 liter of yellow turbid fluid in the pleural space and a white nodular 20 × 30 × 50 cm mass in the ventral thoracic cavity (Fig. 5). The mass weighed 4 kg and involved the pericardium, and the cut surface showed nodules and cyst-like lesions filled with fluid (Fig. 6). Similar small nodular lesions were seen on the parietal pleura and apical lung lobes. The trachea and lungs were displaced dorsally, the lungs were atelectatic and all of the pulmonary lymph nodes were enlarged. Histological evaluation of the mass revealed two different cell populations (Fig. 7): monomorphic small round mononuclear cells with a basophilic nucleus and little cytoplasm (small non-neoplastic lymphocytes) and neoplastic epithelial cells, which were positive for pancytokeratin in immunohistochemical staining (Fig. 8). The latter were spindle-shaped with an elongated oval nucleus and eosinophilic cytoplasm, and there was a moderate number of mitotic figures. Based on the pathological findings, a diagnosis of thymoma of the mediastinum and apical lung lobes was made.

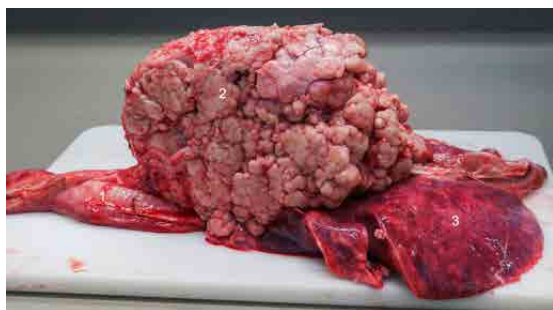
## Discussion

Ruminal tympany was the main reason for referral of the goat, and weight loss, jugular vein distension and muffled heart sounds on the left were the main clinical

findings. Ruminal tympany accompanied by regurgitation were the principal clinical findings reported in an eight-year-old Saanen goat with thymoma (Parish et al., 1996) and were thought to be caused by dorsal displacement of the oesophagus with subsequent impairment of eructation. Jugular vein distension was caused by compression of the cranial vena cava by the thymoma; similar signs have been reported in cattle with thymic lymphoma (Braun et al., 2007). Heart sounds on the left were muffled because the thymoma had displaced the heart medially and there was pleural effusion. Interestingly, although pleural effusion/the tumour had displaced the lungs dorsally, there was no tachypnea and no dyspnea, which was described in a Nubian goat with thymoma (Rostkowski et al., 1985). Likewise, this goat did not have oedema of the head and neck (Jacobs et al., 2002) or of the forelimbs and ventral thorax (Rostkowski et al., 1985). This was likely because the cranial vena cava was only partially compressed resulting in only moderate distension of the jugular veins.

Clinical, sonographic and pathological findings in a Saanen goat with mediastinal thymoma

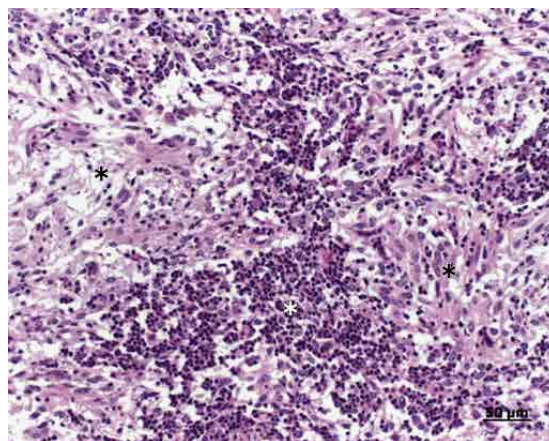
U. Braun et al.



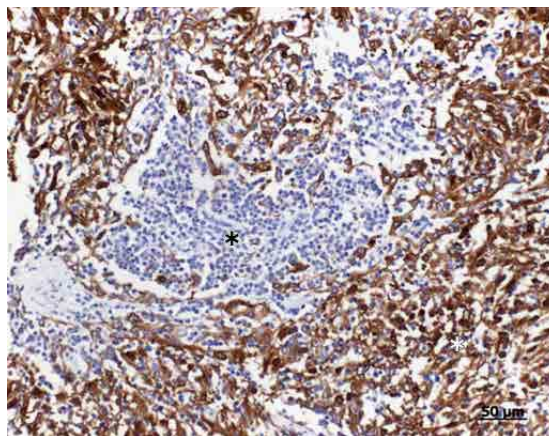
**Figure 5:** Thymoma involving the pericardium and heart in an 11-year-old Saanen goat. The tumour has a nodular appearance and has compromised the lungs. 1 Trachea, 2 Tumour, 3 Right lung. The ventral aspect of the tumour is at the top.



**Figure 6:** Cut surface of a thymoma showing a nodular structure and cyst-like fluid-filled cavities in an 11-year-old Saanen goat.



**Figure 7:** Histological section of a thymoma in an 11-year-old Saanen goat. The tumour consists of small non-neoplastic lymphocytes (white \*) and neoplastic epithelial cells that stain positive for pancytokeratin (black \*). H&E stain.



**Figure 8:** Histological section of a thymoma showing neoplastic epithelial cells (white \*) that are positive for pancytokeratin stain and distinct from the lymphocytes (black \*) in an 11-year-old Saanen goat.

Clinical, sonographic and pathological findings in a Saanen goat with mediastinal thymoma

U. Braun et al.

Severe lymphocytosis pointed to lymphocytic leukaemia (Weiser, 2006), but a diagnosis of the latter takes into consideration lymphocyte morphology as well as lymphocyte numbers (Weiser, 2006). The blood lymphocytes in our patient appeared normal, although persistent lymphocytosis with normal lymphocyte morphology is seen in cattle with enzootic bovine leukosis (Weiser, 2006). Thymoma-associated lymphocytosis is not usual, but has been described in dogs (Batlivala et al., 2010; Burton et al., 2014). We could not find any relation between the increased liver enzymes and the disease.

The degree of dorsal displacement of the lungs in radiographs was remarkable. Based on the radiographic findings of a mass effect in the cranial mediastinum, the goat appeared to have a mediastinal mass rather than a pulmonary mass or pleural effusion alone. The ultrasonographic findings were similar to those previously reported in goats with thymoma (Olchoway et al., 1996; Braun et al., 2009), but massive pleural effusion was not seen by Olchoway et al. (1996). Cytological examination of the pleural fluid in the present case resulted in a mis-

diagnosis of lymphocytic inflammation. In a previous case, the pleural fluid was deemed to be a lymphocyte-rich modified transudate, likely caused by compression of lymphatic vessels by the thymoma (Braun et al., 2009). A definitive diagnosis in vivo is important when treatment is an option because lymphoma has a poor prognosis and thymoma carries a good prognosis when removed surgically, which has been described in dogs and cats (Batlivala et al., 2010; Robat et al., 2013; Burton et al., 2014). Clinical findings aid in differentiation of thymic lymphoma and thymoma in dogs; thymic lymphoma is often accompanied by generalised lymphadenopathy and hypercalcaemia, whereas thymoma is frequently associated with myasthenia gravis (Cronin et al., 2011).

## Conclusions

Similar to previous cases, thymoma could not be diagnosed in vivo. Thymoma should be part of the differential diagnosis in older goats with a thoracic mass.

## References

- Batlivala T. P., Bacon N. J., Avery A. C., Barabas K., Gunn-Christie R. G., Conway J., Avery P. R.: Paraneoplastic T cell lymphocytosis associated with a thymoma in a dog. *J. Small Anim. Pract.* 2010, 51: 491–494.
- Braun U., Hauser B., Meyer S., Feller B.: Cattle with thymic lymphoma and haematoma of the ventral neck: A comparison of findings. *Vet. J.* 2007, 174: 344–350.
- Braun U., Steininger K., Irmer M., Hagen R., Ohlerth S., Ruhl S., Ossent P.: Ultraschall- und CT-Befunde bei einer Ziege mit Thymom im Mediastinum. *Schweiz. Arch. Tierheilk.* 2009, 151: 332–335.
- Burton A. G., Borjesson D. L., Vernau W.: Thymoma-associated lymphocytosis in a dog. *Vet. Clin. Pathol.* 2014, 43: 584–588.
- Cronin K. L., Williams J., Klose T.: What is your diagnosis? Thymoma, thymic lymphoma, or possible hemorrhage in the cranial mediastinal reflection. *J. Am. Vet. Med. Assoc.* 2011, 238: 1107–1108.
- Hadlow W. J.: High prevalence of thymoma in the dairy goat. Report of seventeen cases. *Vet. Pathol.* 1978, 15: 153–169.
- Jacobs R. M., Messick J. B., Valli V. E.: Thymoma. In: Tumors in Domestic Animals. Ed. D. J. Meuten. Iowa State Press, Ames, Iowa, 2002, 165–166.
- Löhr C. V.: One hundred two tumors in 100 goats (1987–2011). *Vet. Pathol.* 2013, 50: 668–675.
- Olchoway T. W., Toal R. L., Brenneman K. A., Slauson D. O., McEntee M. F.: Metastatic thymoma in a goat. *Can. Vet. J.* 1996, 37: 165–167.
- Parish S. M., Middleton J., Baldwin T. J.: Clinical megaesophagus in a goat with thymoma. *Vet. Rec.* 1996, 139: 94.
- Robat C. S., Cesario L., Gaeta R., Miller M., Schrempp D., Chun R., Bauduer F.: Clinical features, treatment options, and outcome in dogs with thymoma: 116 cases (1999–2010). *J. Am. Vet. Med. Assoc.* 2013, 243: 1448–1454.
- Rostkowski C. M., Stirtzinger T., Baird J. D.: Congestive heart failure associated with thymoma in two Nubian goats. *Can. Vet. J.* 1985, 26: 267–269.
- Tschuor A. C., Riond B., Braun U., Lutz H.: Hämatologische und klinisch-chemische Referenzwerte für adulte Ziegen und Schafe. *Schweiz. Arch. Tierheilk.* 2008, 150: 287–295.
- Valli V. E. O., Kiupel M., Bienzle D.: Thymus. In: Jubb, Kennedy, and Palmer's Pathology of Domestic Animals, Volume 1. Ed. M. G. Maxie. Elsevier, Edinburgh, London, New York, Oxford, Philadelphia, St Louis, Sydney, Toronto, 2015, 141–158.
- Weiser G.: Interpretation of leukocyte responses in disease. In: Veterinary Hematology and Clinical Chemistry. Ed. M. A. Thrall. Blackwell Publishing, Iowa, 2006, 135–148.

## Correspondence

Ueli Braun  
Vetsuisse Faculty  
University of Zurich  
Department of Farm Animals  
Winterthurerstrasse 260  
CH-8057 Zurich  
Tel: 0041-44-6358241  
E-Mail: ueli.braun@uzh.ch